Null Results in Brief

Dietary Factors and Cancers of the Renal Pelvis and Ureter

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Introduction

In the United States, cancers of the renal pelvis and ureter (primarily transitional cell carcinomas) are rare and epidemiologic studies are infrequent compared with renal cell cancer (renal parenchyma) of the kidney (primarily adenocarcinomas) or bladder carcinomas [primarily transitional cell carcinomas; (1, 2)]. In this article, we used data from a large case-control study of cancers of the renal pelvis and ureter to examine dietary, anthropometric, and beverage associations. Most previous studies that investigated dietary risk factors for these tumors were combined with cancers of the kidney or bladder primarily due to their anatomic proximity. Earlier publications from this study investigated risks associated with smoking, analgesics, and hypertension (3-6). The strongest risk factor was cigarette smoking [ever smoked odds ratio (OR), 3.1] with long-term smokers having a 7-fold increased risk (6).

Materials and Methods

Detailed methods for case and control selection have been described elsewhere (6). In brief, eligible cases were white men and women ages 20 to 79 years in New Jersey, Iowa, or Los Angeles County, California, with microscopically confirmed cancers of the renal pelvis or ureter newly diagnosed between 1983 and 1986. Interviews were obtained for 498 cases (328 male and 170 female), including 306 with renal pelvis cancer and 192 with ureter cancer. Noninterviewed cases were slightly older than interviewed cases but had a similar distribution by sex and cancer site (6).

Population-based controls were obtained by frequency matching to the cases based on age, gender, and geographic area. Controls younger than 65 years were chosen by random digit dialing (7), whereas older controls were selected from Medicare files of the then Health Care Financing Administration. The interviewer-administered questionnaire gathered information on demographic, anthropometric, and occupational factors as well as smoking, medication, beverage, and dietary history. Body mass index (BMI), (weight (usual) in kilograms/height in meters^2) was requested from individuals for a time period just before their diagnosis/interview and at age 20 years (BMI20). Subjects were classified as underweight (BMI <18.5), normal (BMI 18.5-24.9), overweight (BMI 25-29.9), and obese (BMI $\geq$30), based on NIH guidelines (8).

Usual dietary intake was estimated from a 36-item food frequency questionnaire. Micronutrient levels were estimated by linking these foods to the nutrient density estimates derived from the U.S. Department of Agriculture food composition tables (9) and a U.S. Department of Agriculture-National Cancer Institute carotenoid food composition database (10). Food groups and nutrients were analyzed using quartiles based on the intake distribution of the controls. Unconditional logistic modeling [OR and 95% confidence interval (95% CI)] included adjustment for age, gender, study site, and pack-years of cigarette smoking in eight categories. Risk estimates for renal pelvis and ureter cancers were similar; thus, data are presented for both cancers combined. All P values are two-sided. There was 80% power to detect an OR of $\geq$1.4 for the highest versus the lowest quartile of intake (α = 0.05).

Results

There were no significant associations of cancer risk with being underweight or overweight, vitamin supplement use, or ever use and amount consumed of coffee, tea, or alcohol (Table 1). There were, however, surprising significant trends for number of years drank coffee and tea that reached 1.9 (95% CI, 1.1-3.5) for those who drank coffee for $\geq$51 years, and 1.5 (1.0-2.2) for those who drank tea for $\geq$46 years, despite no corresponding trends in other indicators of caffeine consumption. There was also a small nonsignificant association with cancer risk of drinking more than one glass of water. Similar findings were seen in smokers and nonsmokers separately (data not shown).

Table 2 presents ORs for food groups and nutrients in quartiles of intake from low to high. There were no significant trends seen for intake of food groups or nutrients for all participants, all nonsmokers, or male smokers (data not shown). However, in female smokers (120 cases, 94 controls), high intakes of fruits (P_{trend} = 0.001; highest quartile OR, 0.4; 95% CI, 0.2-0.8), dark yellow vegetables (P_{trend} = 0.06; highest quartile OR, 0.4; 95% CI, 0.1-0.9), and β-cryptoxanthin (P_{trend} = 0.01; highest quartile OR, 0.4; 95% CI, 0.2-0.9) were associated with reduced cancer risk.

Discussion

In our study of renal pelvis and ureter cancers, we found no consistent cancer risk associated with beverage intake, vitamin supplement use, or BMI. These findings are in agreement

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with most of the data on cancers of the renal pelvis and ureter, kidney, and bladder (2, 5, 11). Our finding of a lack of a protective effect for intake of fruit and any type of vegetable or associated nutrients except among female smokers for consumption of fruit, dark-yellow vegetables, and for β-cryptoxanthin is consistent with recent cohort data on bladder cancer (12).

Table 1. ORs for renal pelvis and ureter cancers associated with BMI, vitamin tablet usage, and beverage intake

	Case	Control	OR* (95% CI)
BMI†	*n* = 498	*n* = 496	
Normal	262	269	1.0 (Reference)‡
Underweight	9	6	1.4 (0.5-4.1)
Overweight	171	178	1.0 (0.7-1.3)
Obese	56	42	1.4 (0.9-2.2)
BMI20			
Normal	360	375	1.0 (Reference)
Underweight	54	52	1.2 (0.8-1.8)
Overweight	67	55	1.3 (0.9-2.0)
Obese	13	7	1.8 (0.7-4.8)
Vitamin use			
Never	343	337	1.0 (Reference)
Ever	155	159	0.9 (0.7-1.2)
Years used vitamins			
<5	55	54	0.9 (0.6-1.4)
6-19	60	54	1.0 (0.7-1.5)
20-60	39	51	0.8 (0.5-1.2)
Drank coffee			
Never	35	36	1.0 (Reference)
Ever	463	460	0.9 (0.5-1.5)
No. cups of coffee/d			
<2	79	115	0.7 (0.4-1.3)
2-3.9	103	104	0.9 (0.5-1.6)
≥4	281	241	0.9 (0.5-1.5)
No. years drank coffee			
<35	100	117	0.6 (0.4-1.1)
35-43	86	117	0.7 (0.4-1.2)
44-50	118	115	1.1 (0.6-2.0)
≥51	158	111	1.9§ (1.1-3.5)
Drank tea			
Never	317	307	1.0 (Reference)
Ever	180	188	1.0 (0.7-1.3)
No. cups of tea/d			
<2	48	59	0.9 (0.6-1.3)
2-11	65	62	1.1 (0.7-1.6)
≥12	67	67	1.0 (0.7-1.5)
Years drank tea			
<30	50	59	0.9 (0.6-1.4)
30-45	47	69	0.7 (0.4-1.0)
≥46	83	60	1.5§ (1.0-2.2)
Drank alcohol			
Never	197	216	1.0 (Reference)
Ever	301	280	1.0 (0.8-1.3)
No. drinks of alcohol/d			
<0.5	83	73	1.2 (0.8-1.8)
0.5-0.9	80	96	0.8 (0.6-1.2)
1-1.9	61	50	1.1 (0.7-1.7)
≥2	77	61	1.0 (0.6-1.5)
No. years drank alcohol			
<27	85	69	1.1 (0.7-1.7)
28-37	64	71	0.7 (0.5-1.1)
38-43	70	69	0.9 (0.6-1.4)
≥44	80	70	1.2 (0.8-1.8)
No. glasses of water/d			
≤1	131	134	1.0 (Reference)
1-2.9	105	104	1.3 (0.9-1.8)
3-4.9	143	142	1.3 (0.9-1.8)
≥5	119	116	1.2 (0.9-1.8)

*Adjusted for age at diagnosis (cases) or age at interview (controls), study site, and pack-years of smoking.
†Underweight (BMI < 18.5), normal (BMI 18.5-24.9), overweight (BMI 25.0-29.9), and obese (BMI ≥30).
‡All risks relative to 1.0 normal BMI and BMI20 and for never use of vitamins and never beverage consumption.

This population-based case-control study of cancers of the renal pelvis and ureter is unique in that it had sufficient numbers of study subjects to investigate dietary-related factors, including BMI, vitamin supplementation, beverage consumption, and intake of selected food groups and nutrients, all tightly controlled for and stratified by smoking. Many of our *a priori* hypotheses and comparisons are based on findings from studies of bladder cancer because the renal pelvis and ureter are composed of the same transition cell mucosa and are in anatomic proximity to the bladder. The strengths of our study include its population-based design, a large enough sample size to allow stratification by smoking, the inclusion of female study subjects, and face-to-face interviews with study subjects. A serious limitation was the short dietary questionnaire that focused primarily on vitamin C and vitamin A (retinol and carotenoid) intake, although these food items cover most forms of carotenoids now available in the nutrient database. Other limitations include the relatively low participation rates, absence of any beverage or dietary validation study, possible recall bias due to the retrospective nature of this study, and multiple comparisons. Also, other significant positive findings e.g., for long-term consumption of coffee and tea, could be due to chance.

To our knowledge, this is the only large case-control study of renal pelvis and ureter cancers to investigate dietary-related factors. Although we observed a small protective effect for intake of fruit, yellow vegetables, and β-cryptoxanthin among female smokers, diet and dietary-related factors do not seem to play a major role in the epidemiology of renal pelvis and ureter cancers in this study population.

Appendix A. Food Groups

Dairy products	Whole milk, 2% milk, skim milk, cheese, butter, ice cream
Juices	Orange juice, grapefruit juice, tomato juice, fortified fruit juices
Fruit	Oranges, grapefruit, cantaloupe
Vegetables	Carrots/peas and carrots, sweet potatoes/yams, tomatoes, tomato juice, broccoli, cabbage or coleslaw, cauliflower, brussels sprouts, spinach, southern greens, green salad, mixed vegetables, winter squash, vegetable soup/minestrone
Mixed vegetables	Carrots/peas and carrots, mixed vegetables, vegetable soup/minestrone
Cruciferous vegetables	Broccoli, cabbage or coleslaw, cauliflower, brussels sprouts, collard/mustard/turnip greens
Dark green vegetables	Broccoli, spinach, southern greens
Dark yellow vegetables	Carrots/peas and carrots, sweet potatoes/yams, winter squash
High-lycopene foods	Spaghetti or pasta with tomato sauce, tomatoes, tomato juice, vegetable soup/minestrone, tomato soup

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Table 2. ORs for renal pelvis and ureter cancers associated with selected food groups and nutrients

	OR* lowest quartile reference	OR* 2nd quartile (95% CI)	OR* 3rd quartile (95% CI)	OR* 4th quartile highest (95% CI)
Food groups				
Total fruit	1.0	1.3 (0.9-1.9)	1.0 (0.7-1.4)	1.1 (0.7-1.6)
Juices	1.0	1.0 (0.7-1.5)	1.0 (0.7-1.5)	1.3 (0.9-1.9)
Total vegetables	1.0	1.0 (0.7-1.4)	0.9 (0.7-1.4)	0.9 (0.6-1.3)
Mixed vegetables	1.0	0.7 (0.5-1.1)	1.0 (0.6-1.4)	0.7 (0.5-1.0)
Dark green vegetables	1.0	0.8 (0.5-1.1)	1.0 (0.7-1.5)	0.9 (0.6-1.4)
Dark yellow vegetables	1.0	1.0 (0.7-1.4)	1.0 (0.7-1.4)	1.0 (0.6-1.4)
Cruciferous vegetables	1.0	1.0 (0.7-1.5)	1.0 (0.7-1.4)	0.7 (0.5-1.1)
Soups	1.0	0.8 (0.5-1.1)	0.6 (0.4-0.9)	0.8 (0.5-1.1)
Salads	1.0	0.9 (0.6-1.3)	1.2 (0.8-1.7)	1.0 (0.7-1.5)
Dairy	1.0	1.0 (0.7-1.5)	1.1 (0.8-1.6)	1.1 (0.8-1.6)
Nutrients				
Vitamin C	1.0	0.8 (0.6-1.3)	1.1 (0.8-1.6)	1.1 (0.7-1.6)
Carotene	1.0	0.8 (0.6-1.2)	0.9 (0.6-1.3)	0.8 (0.5-1.2)
β-carotene	1.0	0.8 (0.6-1.2)	0.9 (0.6-1.3)	0.9 (0.6-1.3)
α-carotene	1.0	1.1 (0.7-1.5)	0.8 (0.6-1.2)	0.8 (0.5-1.1)
β-cryptoxanthin	1.0	1.1 (0.7-1.6)	0.9 (0.6-1.3)	1.4 (0.9-2.0)
Lycopene	1.0	0.9 (0.6-1.3)	0.9 (0.6-1.3)	1.1 (0.7-1.6)
Lutein	1.0	0.8 (0.6-1.2)	0.6 (0.4-0.9)	1.2 (0.8-1.8)
Xanthin	1.0	0.9 (0.7-1.4)	0.8 (0.5-1.2)	1.5 (1.0-2.1)
Retinol	1.0	1.6 (1.1-2.3)	1.4 (0.9-2.1)	1.5 (1.2-2.3)

*Adjusted for age at diagnosis (cases) or age at interview (controls), study site, and pack-years of smoking.

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